

Support for Selection of a Methamphetamine Cleanup Standard in Colorado
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- State cleanup methamphetamine standards:
 - Some states have changed their cleanup standards:
 - Arkansas: from .5 ug/ft² to .05 ug/100 cm²
 - Minnesota: from <1 ug/ft² to <.01 ug/100 cm²
 - Oregon: from .5 ug/ft² to .05 ug/100 cm²
 - These standards are based on analytical detection methods and not health-based standards.
 - Toxicity database not available.
 - Levels based on what is believed to be protective and achievable by cleanup.
- Researchers want to estimate an upper bound for exposure to the individuals of concern. These can then be compared to what is known about methamphetamine health effects.
 - Individuals of concern include infant, child of age 6, and adult female of childbearing age.
 - Dermal and oral exposure were the exposures of interest; inhalation exposure and exposure through breast milk, although important, were not studied by the researchers, which might have introduced some uncertainty to the results.
- Estimation of Dermal Dose
 - $PDR = (ISR * TC * ET * ABSD)/BW$
 - PDR : Potential Dose Rate
 - ISR : Indoor Surface Transferable Residue
 - TC : Transfer Coefficient
 - ET : Exposure Time
 - ABSD : Dermal Absorption Fraction
 - BW : Body Weight
- Estimation of Oral Dose
 - $PDR = (ISR * SA * FQ * SE * ET * ABSO)/BW$
 - PDR : Potential Dose Rate
 - ISR : Indoor Surface Transferable Residue

- SA : Surface Area
 - FQ : Frequency of hand-to-mouth events
 - SE: Saliva extraction factor
 - ET: Exposure Time
 - ABSO: Oral Absorption Factor
 - BW: Body Weight
- Using these calculations, it seems that the infant has the highest overall daily dose at every cleanup standard level.
- Therapeutic side effects: anxiety, difficulty falling asleep, and reduced appetite.
 - Since methamphetamine is usually not prescribed to children under 6, the effects of taking the drug therapeutically can only be observed in those over six years of age.
 - For a six-year-old child weighing 21.7 kg, a 5 mg intake is equivalent to a dose of .23 mg/kg-day.
 - For an adult female weighing 70 kg, a 5 mg intake is equivalent to a dose of .07 mg/kg-day.
- Illicit side effects: can produce euphoria, increased alertness, paranoia, decreased appetite, and increased physical activity. Central nervous system effects include writhing, jerky body movements, irritability, insomnia, confusion, tremors, anxiety, tremors, aggression, hyperthermia, and convulsions.
 - Dosage is hard to ascertain in this group.
- Age-dependent susceptibility:
 - Meth can cross the uterine barrier to expose the fetus, which can lead to growth retardation, prematurity, malformations, and perinatal complications.
 - At birth, babies may also exhibit symptoms of methamphetamine withdrawal.
 - Meth is also excreted in breast milk, which can continuously expose babies that are breastfed.
- Animal studies:
 - In rats and rhesus monkeys, repeated subcutaneous exposure to meth resulted in depletions of dopamine and serotonin in the brain.

- Pregnant rats given meth injections both later and earlier in their pregnancy exhibited reduced locomotor activity, spatial learning, and memory performances than the controls.
- Developmental toxicity (in animals):
 - Significant increases in malformations occurred.
 - Decreased litter size and delay of opening of the eyes
- Reproductive effects:
 - Reduced sperm motility in rats
 - No significant effects on maternal or child health in rats
- Results suggest that all of the proposed cleanup standards will be protective of human health exposures.
 - Toxicity reference values ranged from .005 to .07 mg/kg-day, which were much larger than the calculated exposure doses for each of the proposed cleanup standards.
- Cost effectiveness:
 - At .05 ug/100 cm², it is feasible to decontaminate a house, but not necessarily the most cost-effective. Sometimes, just getting rid of the property is more cost-effective than cleaning it.
 - At the .01 level, it becomes more difficult. Sometimes, destroying a whole building is more cost-effective than cleaning a part of it.
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